

$$\begin{aligned}
S &= \int d^4x \left[ -\frac{1}{4} (F_{\mu\nu})^2 \right] \\
&= \frac{1}{2} \int d^4x A_\mu(x) (\partial^2 g^{\mu\nu} - \partial^\mu \partial^\nu) A_\nu(x) \\
&= \frac{1}{2} \int \frac{d^4k}{(2\pi)^4} \tilde{A}_\mu(k) (-k^2 g^{\mu\nu} + k^\mu k^\nu) \tilde{A}_\nu(-k).
\end{aligned}$$

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